

27 September 2004

CRUISE RESULTS
NOAA Fisheries Research Vessel ALBATROSS IV
Cruise No. AL 04-08
Late Summer Ecosystems Monitoring Survey

CRUISE PERIOD AND AREA

The cruise period was 16 - 31 August 2004. The NOAA fisheries research vessel ALBATROSS IV covered the Mid-Atlantic Bight, Southern New England, Georges Bank, and Gulf of Maine regions (Figure 1) for the Late Summer Ecosystems Monitoring Survey.

OBJECTIVES

The primary objective of the cruise was to assess changing biological and physical properties which influence the sustainable productivity of the living marine resources of the Mid-Atlantic, Southern New England, Georges Bank and Gulf of Maine portions of the northeast continental shelf ecosystem.

Secondary objectives of this cruise involved the following sampling:

- comparison plankton tows in deep basin areas of the Gulf of Maine to assess the difference in zooplankton volumes and composition between tows to 200 m and tows to within 5 meters of the bottom. These deep tows also provide hydrographic data detailing incursions of Labrador Current Water into the Gulf of Maine.
- collection of phytoplankton samples for nitrogen stable isotope ratios,
- collection of samples for zooplankton genetics (genome) studies,
- examination of plankton samples for concentrations of Calanus finmarchicus to correlate with right whale sightings.

METHODS

The survey consisted of 120 randomly distributed stations at which the vessel stopped to lower instruments over the side. One non-random station was done in the Northeast Channel where a CTD cast was made to document characteristics of the Gulf of Maine inbound water column. This was the only station for which no plankton sample was taken. Three non-random stations were sampled in three Gulf of Maine basins, and six other non-random stations were added to the Gulf of Maine region to improve coverage of this area when extra time became available at the end of the survey, giving a total of 130 stations sampled

Key parameters measured included water column temperature, salinity, ichthyoplankton and

zooplankton composition, abundance and distribution, and along-track chlorophyll-a fluorescence.

A double oblique tow using the 61-centimeter Bongo sampler and a Seabird CTD was made at 129 stations. The tow was made to approximately 5 meters above the bottom, or to a maximum depth of 200 meters, at a ship speed of 1.5 knots. On the 3 Gulf of Maine deep basin stations, additional tows to below 200 meters were made prior to the 200 meter tows, with the ship returning to the same position that the deep tow had started at. These special tows brought the sampling nets to within 5 meters of the bottom for comparison of the zooplankton volume and composition between the 200 meter and deeper tows in the same area. Plankton sampling gear consisted of a 61-centimeter mouth diameter aluminum Bongo frame with two 333-micron nylon mesh nets. A 45-kilogram lead ball was attached by an 80-centimeter length of 3/8-inch diameter chain below the aluminum Bongo frame to depress the sampler. A digital flowmeter was suspended within the mouth of each sampler to determine the amount of water filtered by each net. The plankton sampling gear was deployed over the port side of the vessel by means of a conducting-cable winch and a powered boom. The 61-centimeter Bongo plankton samples were preserved in a 5 % solution of formalin in seawater. Tow depth was monitored in real time with a Seabird CTD profiler. The Seabird CTD profiler was hard-wired to the conductive towing cable, providing simultaneous depth, temperature, and salinity data for each plankton tow.

Twenty phytoplankton samples for nitrogen-stable isotope ratio analysis were collected from the discharge water of the near-surface flow-through system. Samples of 800 to 1000 milliliters of seawater were pre-filtered through 300 micron mesh nitex gauze to remove most zooplankton, then filtered through a Whatman GFF glass-fiber filter and flash frozen for analysis ashore.

A total of nineteen zooplankton genetics samples were collected at five randomly selected stations within each of the Mid-Atlantic, Southern New England, Georges Bank and Gulf of Maine regions. These samples were collected with a 20 cm Bongo frame fitted with paired 165 micron mesh nets and this array was attached to the towing wire above the Seabird CTD with a wire stop. The samples were preserved in 95% ethanol. After 24 hours of initial preservation, the alcohol was changed.

Catches that contained numerous gelatinous organisms such as Medusae, Ctenophores, and Salps, collectively called jelly fish, were washed through a 4-mm sieve with sea water. This was done to separate most of the jelly fish from the rest of the plankton sample. The metric volume of the washed jelly fish were then measured and the jelly fish discarded. At a selected station, 0.5 liters of washed Salps were preserved in a 5% solution of formalin. Volumetric analysis will be done ashore to determine the body fluid loss of the Salps due to the preservative.

Following the cruise, samples with large numbers of Calanus finmarchicus were measured for settled volumes and the data forwarded to Pat Gerrior, the Regional Right Whale Sighting Coordinator, and to Tim Cole of the Protected Species Branch.

Continuous monitoring of the seawater salinity, and chlorophyll-a level, was done at a depth of 3.7 meters along all of the cruise track by means of a thermosalinograph, and a flow-through fluorometer. The SCS system recorded the output from both the thermosalinograph, and the

fluorometer at ten seconds intervals. The data records were given a time-date stamp from the GPS unit.

Samples for Seabird CTD salinity data calibration were obtained on the 12-6 watch by taking a water sample from 30 or more meters depth using a 1.7 liter Niskin bottle. Calibration of the fluorometer and CTD salinities from the surface flow-through system was undertaken on the 6-12 watch. Sample analysis for these calibrations followed the protocol outlined in the Ecosystem Monitoring Program Operations Manual.

RESULTS

A summary of routine survey activities is presented in Table 1. Areal coverage for the cruise is shown in Figure 1. The R/V ALBATROSS IV sailed at 1410 hours EDT on Monday, August 16, from NEFSC, Woods Hole Massachusetts to begin Part I of the Late Summer Ecosystems Monitoring Survey. Shortly after departure a ship's meeting was held to review survey operations and vessel safety procedures for the cruise. Thereafter, both fire and abandon ship drills were held for the entire ships personnel. Weather condition were pleasant with partly overcast skies with light south winds and calm seas. The ship proceeded on an offshore southerly course to begin survey operations off Long Island in the Southern New England (SNE) subarea and arrived on station at 2330 hrs.

When processing the Seabird CTD cast with the designated software program, an error message was displayed and the software program could not complete its data analysis for station one. As the ship was underway toward the next station it was decided to stop the vessel and resolve the cause of the program error message. Several short vertical cast were made with the CTD. Attempted data analysis of these casts resulted in the same error message, even when another version of the software program was used. The CTD used at this time was fitted with a fluorometer. A back up Seabird CTD without the fluorometer was substituted on the wire and a short vertical cast made. Software data analysis for this cast was processed complete without any difficulty. As the ship was only a few miles from station one, a decision was made to return to station and redo the bongo/CTD tow. The remainder of Part I of this survey was made with the substituted CTD without the fluorometer. Subsequent correspondence with NEFSC personnel ashore during the cruise revealed that the problem was in the Seabird data conversion software.

The R/V ALBATROSS IV proceeded in a southerly direction to complete the offshore stations in the Mid-Atlantic Bight (MAB) subarea. At the southern most station off North Carolina the ship turned and occupied both the inshore and mid-shelf stations on a northerly track through the MAB. Upon reentering the SNE subarea, a zig-zag type cruise track was employed to allow the greatest number of stations to be occupied in the least amount of time as the vessel worked from west to east towards Georges Bank.

The last station for Part I was completed on Georges Bank just east of Great South Channel on Monday, August 23, at 0005 hrs. The ship then proceeded through the Great Round Shoal Channel, arriving at the NEFSC dock in Woods Hole, Massachusetts at 1018 hrs Monday, August 23, completing Part I of cruise AL0408.

Weather conditions for Part I of the cruise were favorable for survey operations which allowed for rapid transit between stations. In addition, vessel personnel were helpful and familiar with the required work procedures. Thereby, survey operations progressed on a routine and efficient basis which contributed to the large number of stations occupied.

Part II of the cruise departed from Woods Hole on Tuesday August 24 at 1100 hours, after re-fueling that morning. The vessel steamed through Great Round Shoal Channel and on to Georges Bank to resume working where the first part of the cruise had left off. Work started in the evening of that same day. Stations were occupied in the southwestern portion of the Gulf of Maine and the northwestern part of Georges Bank during the first days of the cruise, with work progressing towards the eastern part of Georges and then on into the Gulf of Maine later on. While working on the southern flank of Georges Bank high temperatures and salinities were encountered at station 82. After contacting Grayson Wood at CoastWatch for the Northeast Region located at the Narragansett Laboratory, a sea-surface temperature satellite image was sent to the vessel, revealing that this station was located on the periphery of a large warm-core ring (Figure 2.)

Work in the Gulf of Maine was done from east to west and in a zig-zag fashion between inshore and offshore stations. After only four days had elapsed on this second part of the cruise, it became apparent that work was progressing so rapidly due to excellent weather and support from the vessel crew and officers, that the standard work would be completed in less than a week's time. For this reason, six extra non-randomly selected stations were added to improve spatial coverage of the Gulf of Maine areas to primarily bolster inshore sampling which the randomly selected pattern had left poorly represented. This was done in response to a request from Joseph Kane at the NEFSC Narragansett laboratory to undertake extra sampling should time permit.

In addition to these non-random stations which were added near the end of the cruise, there were four additional non-random stations which were occupied as part of the original plan. A CTD cast was made in the Northeast Channel to provide hydrographic data detailing the incursion of Labrador Current Water into the Gulf on Maine. Two water samples were also collected on this cast to provide nitrogen isotope samples for Owen Sherwood of Dalhousie University in Halifax, Nova Scotia. Two bongo casts were made in Wilkinson Basin, Georges Basin and Jordans Basin. The first bongo tow in each basin was made to within 5 meters of the bottom, while the second tow was made to 200 m. These tows were done to assess the difference in zooplankton volumes and the composition between the 200 m tows and the tows to within 5 m of the basin bottom.

The last station was completed at the entrance to Cape Cod Bay at 0430 EDT on Tuesday, 31 August, after which the ship proceeded through the Cape Cod Canal to Woods Hole. The R/V ALBATROSS IV arrived at the NEFSC in Woods Hole, Massachusetts, and docked at 1200 hrs Tuesday, completing cruise AL0408.

DISPOSITION OF SAMPLES AND DATA

All samples and data, except for the nitrogen isotope samples, the zooplankton genetics samples and the Seabird CTD data, were delivered to the Ecosystems Monitoring Group of the NEFSC,

Narragansett, RI, for quality control processing and further analysis. All the nitrogen isotope samples were delivered to Rick McKinney at the US EPA Lab in Narragansett, RI. The zooplankton genetics samples were deposited at the Woods Hole Oceanographic Institute. The CTD data, and original logsheets were delivered to the Oceanography Branch of the NEFSC, Woods Hole, MA. Copies of the CTD Station Operations Logsheets went to the Ecosystems Monitoring Group in Narragansett. Calanus volume information was forwarded to Pat Gerrior and Tim Cole after the cruise

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Table 1. STATION OPERATION REPORT FOR CRUISE AL0408

CAST	STA.	Date (GMT)			TIME (GMT)		LAT	LONG	DEPTH	OPER.
		mm	dd	yy	hr	min				
									(m)	B=bongo W=water Z=zoogen N=nitrogen V=vertical cast (CTD only) D=deep tow CO=Calanus observed/vol
4	1	8	17	2004	5	23	3956.1	7140.5	119	B,N1,CO/ 391cc
5	2	8	17	2004	9	58	3926.4	7232.9	112	B, CO/ 433cc
6	3	8	17	2004	10	59	3933.6	7238.8	77	B
7	4	8	17	2004	11	57	3935.9	7250.6	65	B,Z1
8	5	8	17	2004	14	56	3908.9	7312.8	65	B
9	6	8	17	2004	16	52	3903.7	7248.9	117	W
10	6	8	17	2004	17	5	3903.7	7248.9	118	B
11	7	8	17	2004	20	5	3836.6	7310.5	649	B,N2
12	8	8	17	2004	21	42	3828.8	7326.7	105	B
13	9	8	17	2004	22	21	3824.1	7326.9	118	B,Z2
14	10	8	18	2004	3	16	3756.6	7425.9	56	B
15	11	8	18	2004	4	44	3748.9	7442.3	45	B,Z3
16	12	8	18	2004	7	58	3713.9	7450.7	52	W
17	12	8	18	2004	8	6	3713.7	7450.7	52	B
18	13	8	18	2004	9	36	3703.8	7435	244	B,N3,Z4
19	14	8	18	2004	16	8	3558.9	7506.6	28	B
20	15	8	18	2004	17	55	3546	7450.7	255	B,N4
21	16	8	18	2004	21	5	3544.2	7526.4	15	W
22	16	8	18	2004	21	12	3544.3	7526.4	16	B
23	17	8	18	2004	22	18	3551.2	7530.8	20	B,N5
24	18	8	19	2004	1	50	3629.1	7526	28	B
25	19	8	19	2004	3	9	3642.8	7526.7	24	B
26	20	8	19	2004	4	13	3646.1	7538.1	19	W,N6
27	20	8	19	2004	4	22	3646.2	7538.1	20	B
28	21	8	19	2004	6	47	3711.4	7542.3	12	B
29	22	8	19	2004	8	51	3711.2	7514.8	27	B
30	23	8	19	2004	10	5	3723.6	7513	22	B
31	24	8	19	2004	11	19	3723.8	7528.3	22	B,Z5
32	25	8	19	2004	16	17	3806.2	7441.3	31	W
33	25	8	19	2004	16	24	3806.3	7441.3	30	B
34	26	8	19	2004	17	54	3811.1	7458.6	20	B
35	27	8	19	2004	22	1	3853.8	7432.8	24	B,N7
36	27	8	19	2004	23	45	3908.1	7419.8	24	B
37	29	8	20	2004	1	49	3911.3	7352.7	41	B
38	30	8	20	2004	4	15	3933.6	7408.8	18	W
39	30	8	20	2004	4	25	3933.7	7408.9	18	B
40	31	8	20	2004	6	3	3948.7	7402.5	17	B
41	32	8	20	2004	7	59	3941	7338.8	32	B
42	33	8	20	2004	8	38	3936.2	7336.5	31	B
43	34	8	20	2004	9	11	3938.6	7332.8	36	B
44	35	8	20	2004	10	27	3951.1	7328.7	36	B
45	36	8	20	2004	13	1	4013.8	7309	42	B

Table 1. (continued) STATION OPERATION REPORT FOR CRUISE AL0408

CAST	STA.	Date (GMT)			TIME (GMT)		LAT	LONG	DEPTH	OPER.
		mm	dd	yy	hr	min				
									(m)	
										B=bongo W=water Z=zoogen N=nitrogen V=vertical cast (CTD only) D=deep tow CO=Calanus observed/vol
46	37	8	20	2004	15	23	3956.2	7246.8	56	B,Z6
47	38	8	20	2004	18	16	4013.9	7214.3	59	W
48	38	8	20	2004	18	27	4013.9	7214.4	59	B
49	39	8	20	2004	19	45	4016.2	7228.7	55	B
50	40	8	20	2004	21	47	4026.2	7252.7	42	B
51	41	8	20	2004	22	41	4033.7	7258.7	26	B,N8,Z7
52	42	8	21	2004	2	14	4053.9	7214.7	19	B
53	43	8	21	2004	5	2	4056	7136.4	53	W
54	43	8	21	2004	5	14	4055.9	7136.5	53	B
55	44	8	21	2004	7	39	4056.1	7102	50	B,N9
56	45	8	21	2004	8	36	4053.6	7052.8	52	B,Z8,CO/ 433cc
57	46	8	21	2004	11	19	4043.8	7126.9	61	B
58	47	8	21	2004	12	58	4029.6	7132.5	75	B
59	48	8	21	2004	14	12	4019.1	7134.7	82	B, CO/ 232cc
60	49	8	21	2004	15	58	4026.3	7114.7	78	W
61	49	8	21	2004	16	9	4026.5	7114.8	78	B,Z9
62	50	8	21	2004	20	17	4011.5	7022.2	112	B, CO/ 174cc
63	51	8	21	2004	23	19	4006.5	6940.8	98	B,Z10,CO/ 238cc
64	52	8	22	2004	2	19	4033.6	6952.7	63	B
65	53	8	22	2004	4	17	4046.3	7012.7	42	W
66	53	8	22	2004	4	26	4046.5	7012.4	42	B
67	54	8	22	2004	6	22	4106.2	7018.6	34	B
68	55	8	22	2004	8	14	4054.9	6959.4	29	B
69	56	8	22	2004	12	24	4054.4	6924.3	43	B
70	57	8	22	2004	13	51	4058.5	6909.2	68	B
71	58	8	22	2004	15	50	4041.4	6916.4	54	B
72	59	8	22	2004	18	25	4021.8	6857	87	W
73	59	8	22	2004	18	38	4021.9	6856.9	87	B
74	60	8	22	2004	19	51	4016.3	6844.9	102	B
75	61	8	22	2004	21	43	4033.6	6850.4	67	B
76	62	8	22	2004	22	43	4041.3	6854.4	66	B
77	63	8	23	2004	0	11	4043.6	6834.9	59	B
78	64	8	23	2004	1	46	4051.1	6851	66	B
79	65	8	23	2004	3	4	4101.3	6846.8	64	B
80	66	8	23	2004	3	55	4101.3	6837.4	56	B
81	67	8	24	2004	22	55	4128.7	6850.9	132	B, CO/ 238cc
82	68	8	25	2004	1	0	4133.2	6823.1	46	B
83	69	8	25	2004	2	7	4131.1	6811	39	B
84	70	8	25	2004	4	43	4153.9	6822.6	202	W

Table 1.(continued) STATION OPERATION REPORT FOR CRUISE AL0408

CAST	STA.	Date (GMT)			TIME (GMT)		LAT	LONG	DEPTH	OPER.
		mm	dd	yy	hr	min				
									(m)	B=bongo W=water Z=zoogen N=nitrogen V=vertical cast (CTD only) D=deep tow CO=Calanus observed/vol
85	70	8	25	2004	4	52	4153.8	6822.5	201	B, CO/ 470cc
86	71	8	25	2004	6	16	4154.1	6834.5	165	B, CO/ 370cc
87	72	8	25	2004	9	23	4223.2	6817.2	195	B, CO/ 264cc
88	73	8	25	2004	10	48	4213.7	6814.6	196	B, CO/ 285cc
89	74	8	25	2004	12	48	4201.5	6759.2	195	B,Z11
90	75	8	25	2004	14	28	4158.7	6740.6	49	B
91	76	8	25	2004	17	0	4134.6	6744.2	43	V,N10
92	76	8	25	2004	17	9	4134.6	6744.3	43	B
93	77	8	25	2004	22	26	4111.4	6759.6	42	B
94	77	8	25	2004	22	41	4111	6759.4	38	W
95	78	8	26	2004	0	58	4046.3	6802.9	68	B,Z12,CO/ 380cc
96	79	8	26	2004	3	50	4105.9	6734.3	57	B
97	80	8	26	2004	4	45	4106.2	6724.7	54	W
98	80	8	26	2004	4	50	4106.1	6724.8	55	B
99	81	8	26	2004	6	20	4051.3	6728.4	76	B, CO/ 354cc
100	82	8	26	2004	8	56	4024.3	6734.8	165	B
101	83	8	26	2004	11	46	4038.6	6703	269	B,N11
102	83	8	26	2004	12	43	4039.3	6702	233	V
103	84	8	26	2004	14	42	4055.9	6651.1	89	B,Z13
104	85	8	26	2004	17	32	4118.2	6710.8	52	W
105	85	8	26	2004	17	40	4118	6710.9	52	B
106	86	8	26	2004	18	42	4126	6714.4	37	B
107	86	8	26	2004	18	53	4125.5	6714.4	43	V
108	87	8	26	2004	21	8	4131.2	6647.9	68	B
109	88	8	26	2004	21	37	4131.2	6643.1	70	B
110	89	8	26	2004	22	53	4138.7	6630.8	77	B,Z14
111	90	8	27	2004	1	25	4128.9	6557.4	236	V
112	90	8	27	2004	1	42	4128.7	6557.2	260	B
113	91	8	27	2004	3	32	4143.4	6550.7	126	B, CO/ 333cc
114	92	8	27	2004	4	33	4146	6558.6	100	W
115	92	8	27	2004	4	40	4145.8	6558.4	100	B, CO/ 174cc
116	93	8	27	2004	5	15	4144	6602.9	93	B, CO/ 264cc
117	94	8	27	2004	6	42	4151.1	6615.1	78	B
118	95	8	27	2004	7	39	4148.8	6626.5	78	B
119	96	8	27	2004	9	25	4206	6620.5	83	B,N12,CO/ 201cc
120	97	8	27	2004	12	3	4213.6	6546.1	222	W,N13,N14,N15
121	98	8	27	2004	14	48	4223.7	6514.9	116	B
122	99	8	27	2004	18	45	4243.7	6559.9	74	W
123	99	8	27	2004	18	53	4243.6	6600.1	74	B, CO/ 195cc
124	100	8	27	2004	21	3	4228.8	6626.6	254	V
125	100	8	27	2004	21	22	4229.1	6627.1	254	B
126	101	8	27	2004	23	13	4228.7	6650.7	312	V
127	101	8	27	2004	23	31	4228.9	6650.8	310	B,Z15,CO/ 174cc

Table 1.(continued) STATION OPERATION REPORT FOR CRUISE AL0408

CAST	STA.	Date (GMT)			TIME (GMT)		LAT	LONG	DEPTH	OPER.
		mm	dd	yy	hr	min				
									(m)	B=bongo W=water Z=zoogen N=nitrogen V=vertical cast (CTD only) D=deep tow CO=Calanus observed/vol
128	102	8	28	2004	0	28	4225	6659.5	360	B, CO/ 158cc
129	102	8	28	2004	1	28	4225	6659.3	360	B,D, CO/ 792cc
130	103	8	28	2004	6	9	4301.2	6620.6	133	W
131	103	8	28	2004	6	18	4301.1	6620.5	134	B
132	104	8	28	2004	9	0	4308.8	6656.8	150	B
133	105	8	28	2004	12	38	4348.4	6700.7	156	B,N16,Z16,CO/227cc
134	106	8	28	2004	15	33	4415.6	6649.1	184	B, CO/ 396cc
135	107	8	28	2004	19	21	4446.2	6632.9	140	W
136	107	8	28	2004	19	31	4446.2	6633.1	138	B, CO/ 343cc
137	108	8	29	2004	1	38	4418.7	6742.4	88	B,N17,Z18
138	109	8	29	2004	3	56	4404.1	6808.9	88	W
139	109	8	29	2004	4	4	4404	6809.1	87	B, CO/ 116cc
140	110	8	29	2004	7	16	4349	6726.7	222	V
141	110	8	29	2004	7	28	4349	6726.7	223	B, CO/ 438cc
142	111	8	29	2004	8	35	4341.1	6730.3	224	V
143	111	8	29	2004	8	47	4341.1	6730.4	224	B, CO/ 364cc
144	112	8	29	2004	10	53	4324.3	6741.8	244	B, CO/ 312cc
145	112	8	29	2004	11	34	4324.3	6741.8	244	B,D, CO/ 528cc
146	113	8	29	2004	14	20	4258.8	6750.7	181	B, CO/ 349cc
147	114	8	29	2004	16	37	4318.7	6806.8	213	W
148	114	8	29	2004	16	53	4318.8	6807	211	B, CO/ 338cc
149	115	8	29	2004	18	36	4331.2	6818.9	196	B, CO/ 454cc
150	116	8	29	2004	21	10	4347	6845	81	B
151	117	8	29	2004	23	20	4340.6	6915	87	B
152	118	8	30	2004	1	52	4323.9	6846.8	112	B
153	119	8	30	2004	4	23	4301.3	6900.8	132	W
154	119	8	30	2004	4	35	4301.3	6900.7	133	B, CO/ 306cc
155	120	8	30	2004	10	59	4330.3	7017.4	26	B,N18
156	121	8	30	2004	13	4	4315.8	6958.7	125	B,Z19, CO/ 275cc
157	122	8	30	2004	15	35	4258.6	6936.8	152	B, CO/ 158cc
158	123	8	30	2004	17	0	4248.6	6946.9	261	W
159	123	8	30	2004	17	17	4248.7	6947.2	262	B, CO/ 317cc
160	124	8	30	2004	18	34	4246.2	6934.7	193	B, CO/ 238cc
161	125	8	30	2004	21	31	4217.2	6918	208	B, CO/ 203cc
162	126	8	30	2004	23	42	4230	6940	253	B, CO/ 306cc
163	126	8	31	2004	0	26	4229.9	6939.9	253	B,D, CO/ 401cc
164	127	8	31	2004	2	28	4238.6	7002.4	113	B, CO/ 185cc
165	128	8	31	2004	4	13	4238.6	7026	48	W,N19
166	128	8	31	2004	4	20	4238.5	7026.1	48	B, CO/ 306cc
167	129	8	31	2004	6	8	4221.9	7018.4	32	B, CO/ 203cc
168	130	8	31	2004	8	7	4203.8	7024.9	51	B,N20, CO/ 227cc

Table 1. (continued) STATION OPERATION REPORT FOR CRUISE AL0408

TOTALS:	Bongo Casts	= 132	(3 were deep basin tows)
	Bongo 6B3Z Samples	= 132	
	Bongo 6B3I Samples	= 132	
	Dalhousie University		
	Nitrogen samples	= 3	
	Water Samples	= 24	
	CTD Casts	= 168	
	EPA Nitrogen samples	= 17	
	Zoogen samples	= 19	
	<u>Calanus</u> observations	= 44	

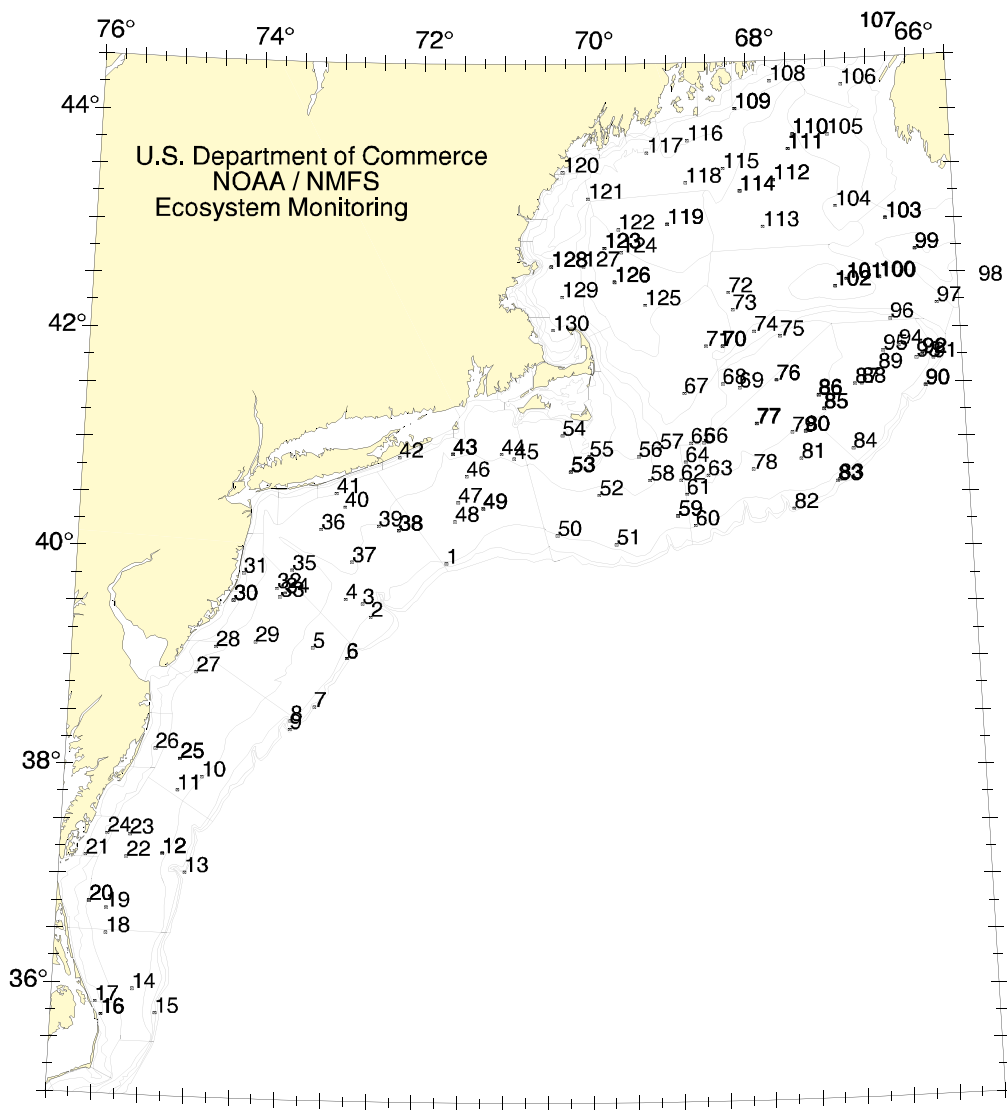


Figure 1.
Station
locations
numbered
consecuti
vely for
Late
Summer

Ecosystem
s
Monitorin
g Cruise

AL 04-08, 16 - 31 August 2004.

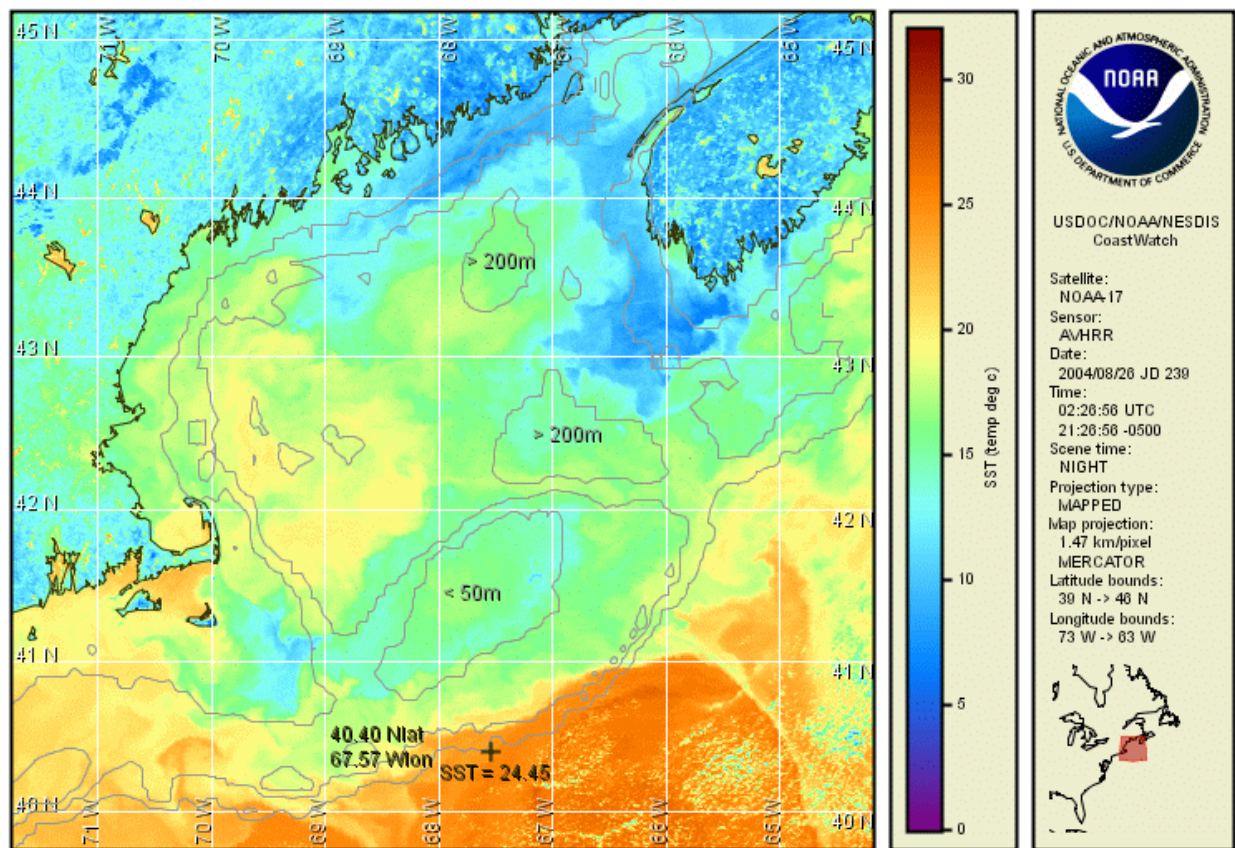


Figure 2.

A satellite image showing Sea Surface Temperatures (SST) on 26 August 2004. The + symbol indicates the location of station 82 from Cruise AL0408, where high temperatures and salinities were encountered on the periphery of a large warm-core ring.